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BUREAU OF SHIPS GROUP  
TECHNICAL INSPECTION REPORT

Changed from RO to DI by RESWP 8th. 123-5K

GROUP 3
Downgraded at 12 year intervals
(For Automaticity Designated)

Operation Crossroads, U.S.S. SARATOGA (CV 3)

TEST BAKER

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OPERATION CROSSROADS

DIRECTOR OF SHIP MATERIAL  
JOINT TASK FORCE ONE

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8568

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ATOMIC ENERGY ACT 1946

(11) 1946  
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BUREAU OF SHIPS GROUP  
TECHNICAL INSPECTION REPORT

GROUP 3  
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Classification (Changed to) ~~CONFIDENTIAL~~ GROUP 3 DATED 16 APRIL 1949  
By John H. Doyle Date MAY 16 1952

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U.S.S. SARATOGA (CV3)

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U.S.S. SARATOGA (CV 3)

SHIP CHARACTERISTICS

Building Yard: New York Shipbuilding Corporation.

Commissioned: 16 November 1927.

HULL

Length Overall: 901 feet 2 inches.  
Length on Waterline: 850 feet 0 inches.  
Beam (extreme, at or below waterline): 111 feet 9 inches.  
Beam (extreme, above main deck): 130 feet 1 inch.  
Depth (molded at side, to upper deck, amidships): 74 feet 0 inches.  
Drafts at time of test: Fwd. 28 feet 8 inches.  
31 feet 6 inches.  
Standard displacement: 33,003 tons.  
Displacement at time of test: 44,500 tons.

MAIN PROPULSION PLANT

Main Engines: Four sets of main general electric turbines connected to main propulsion generators. Four main propulsion motors, one per shaft.  
Main Condensers: Four installed in ship.  
Boilers: Sixteen installed in ship. Type: White - Foster. 300 psi - gauge, 522° F.  
Propellers: Four installed in ship.  
Main Shafts: Four installed in ship.  
Ships Service Generators: Six installed in ship. 750 K.W. each.

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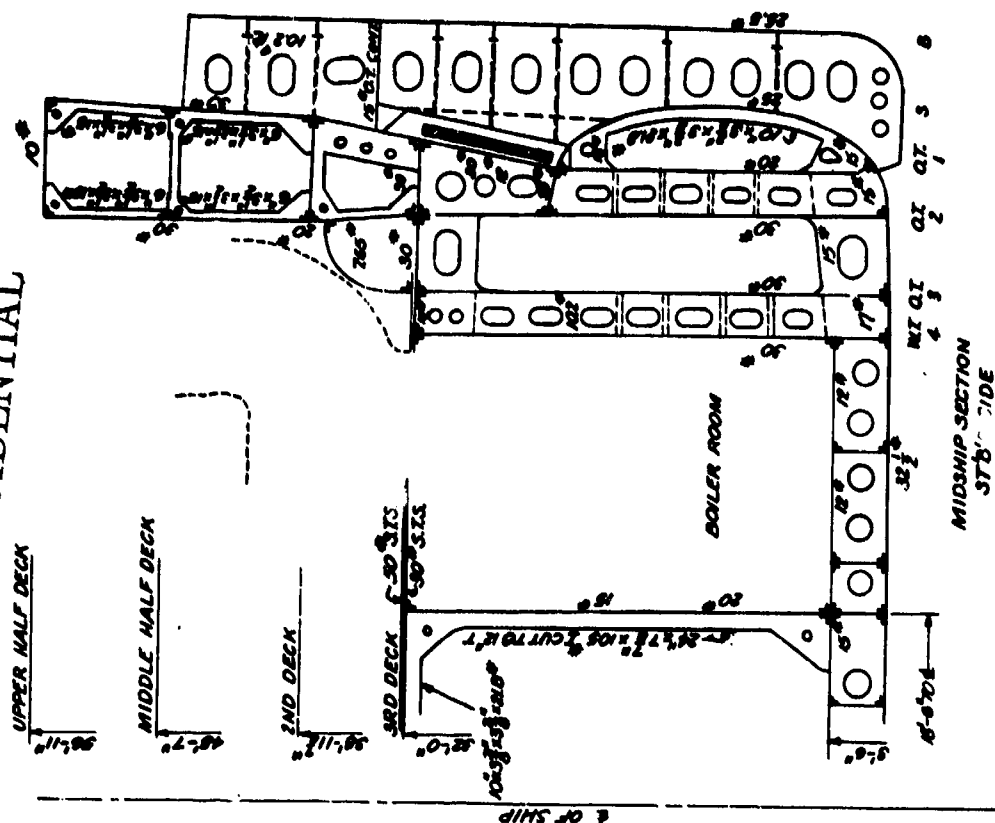
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TEST - B

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## TECHNICAL INSPECTION REPORT

### OVERALL SUMMARY

#### I. Target Condition After Test.

- (a) Drafts after test; list; general areas of flooding, sources.

The SARATOGA sank approximately seven hours and thirty-five minutes after the underwater explosion.

Thirty-three minutes elapsed after the burst before the SARATOGA became clearly visible to the Technical Observer in PBM Charlie. At this time, 0908 on "H" day, the Technical Observer reported the ship low in the water and listing to starboard. The SARATOGA settled, without apparent change in attitude, until at 1029 the top of the starboard blister was reported as being within two or three feet of the water. The ship then had a slight starboard list and was trimmed slightly by the stern. At 1058, the water began to lap over the blister and at 1109 the blister was reported completely underwater. Light smoke or steam was sighted at 1139 on the port quarter of the ship about half the distance from amidships to the stern. This smoke thickened for a few minutes and then disappeared about 1145. This may have been caused by salt water reaching the diesel generator which operated during the test. The next report by the Technical Observer concerning the SARATOGA's flooding was at 1410 when she was reported as having settled deeper. At 1505 it was reported that the after starboard edge of the flight deck was within 10 feet of the water and that the ship was listing 3 degrees. At 1545 the flight deck was reported three feet above the water. (See photographs, pages 15, 16, 17, 19 and 20 for selected PBM Charlie photographs of the listing SARATOGA). At 1555 the Technical Observer reported the SARATOGA sinking. Her flight deck was awash from a point approximately 100 feet abaft the island structure to the centerline at the stern. (Photographs on pages 21, 22, 23, 24, and 25). The list had increased to approximately 8 degrees. At this time, water was pouring in through the stack openings in the flight deck and down the elevator. By 1600 the stern had apparently struck bottom. The ship righted and hung momentarily with the mast, the top of the pilothouse and approximately 150 feet of the bow out

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U.S.S. SARATOGA (CV3)



of water. Air escaping all along the port side bubbled violently to the surface throwing spray into the air. At approximately 1608 the bow of the ship went up and at 1610 the top of the mast disappeared (photograph on page 26).

The only shell damage reported by the divers was a tear in the hull in way of the forward starboard strut. This tear, probable bottom damage, possible failure of sea chests and sea valves, and the swamping effect of water descending from the column were apparently the flooding sources. The oil slicks on the water surrounding the SARATOGA indicate that the bottom plating is damaged.

#### (b) Structural damage.

The divers, during the time allocated for SARATOGA underwater inspection, were able to examine only the ship's flight deck and starboard shell plating. Structural damage reported in these areas was slight and not sufficiently extensive to explain the early increase in draft. Bottom shell plating, where more extensive damage is suspected to exist, and port shell plating were not inspected.

The only break in the shell plating reported by the divers was located in the stern. The shell plating and doubler plate in way of the forward starboard strut were damaged. The strut was broken just outside the hull and had buckled and torn out the doubler plate and fractured the shell plating.

The after strut was broken midway between the barrel and the shell of the ship. The lower portion of the after strut and the rest of the stern, is buried in the mud up to the shafts. The rudders, pintles, gudgeons and bearings are apparently in good condition though half buried. The propellers scooped out holes in the lagoon bottom when the ship settled. They are almost wholly visible and appear in good condition. The shafting seems to be in line and there is no apparent damage to the stern tubes.

Except for the one break, the starboard side of the hull was in good condition aft of frame 144. Forward of frame 144, no great damage to the starboard shell plating was reported by the divers. They reported a three to six inch dishing of the plating above the bilge between frames 68 and 137. The bilge plating was apparently undamaged in this area.

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The greatest damage to the flight deck reported by the divers was at the stern of the ship. The flight deck is dished from approximately 15 feet forward of the after edge to about frame 130. This indentation which can be seen in photographs on pages 15 and 19 slopes forward and downward to a depth of about 12 feet at frame 130. Transversely it extends between the port and starboard outermost longitudinal bulkheads. The deepest indentation is midway between the two bulkheads. This indentation is gradual with no abrupt breaks or bends. There is no indication that the steel deck has been ruptured but the wood decking has been splintered and broken as shown in photographs on pages 32, 33 and 34.

The divers reported that the platform which covered the original number two elevator is missing. This platform later was reported to have been found on the starboard quarter of the ship. A drip pan, formerly installed under the completely fueled airplane at frame 138, was blown out of its location. (See photograph on page 15). This may be the reported elevator platform. Furthermore the flight deck appears intact where the number two elevator was formerly located. See photographs on pages 18, 19 and 20.

Forward of frame 130, the only damage reported by the divers and visible in photographs on page 16, 19 and 20 was the collapse of the forward elevator platform. The platform was dished downward diagonally from the forward port to after starboard corner. The port side of the platform appears in the photographs to be below the level of the flight deck whereas the starboard side appears to be above this level.

The stack was split into two sections. Three quarters of the stack can be seen on the deck in photographs 15, 18, 19 and 20. The remaining portion of the stack stands erect but is twisted about 20 degrees counter clockwise. (See photographs on pages 16 and 19).

The top foremast was broken off above the SK radar platform. (See photographs on pages 17 and 18). The stub mast as shown in photograph on page 20 has been bent to port.

#### (c) Other damage.

Machinery and electrical damage were unobserved.

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The SK, YE, and MK 12-22 antennae are missing. The whip antennae installed forward, at the starboard side of the flight deck, were missing after the blast. The radar equipment located on the forward portion of the stack was damaged.

## II. Forces Evidenced and Effects Noted.

- (a) Heat.  
Unobserved.
- (b) Fires and explosions.  
Unobserved.
- (c) Shock.  
Unobserved.
- (d) Pressure.

Part of the stack was toppled over onto the flight deck. Most of the Army equipment, the airplanes, one of the drip pans installed for an airplane and some instrumentation were missing from their installed positions on the flight deck. They may have been blown off the ship or washed over the side by the descending water column.

The SARATOGA which was approximately 300 yards from the burst was moved sidewise. The photographs on pages 27 and 28 show how the ship was displaced outwardly to about 800 yards, the maximum displacement occurring about three minutes, thirty-two seconds after the burst. She began to move inward again until at forty-four minutes after burst she was approximately 600 yards out. See photograph on page 29. The true bearing of the SARATOGA changed from 180 degrees to 170 degrees during this movement.

The wave caused by the underwater explosion lifted the SARATOGA vertically. Her stern rose at least 43 feet and her bow at least 29 feet. Compare photographs on pages 13 and 14. It is possible that some damage to the SARATOGA may have been caused by the ship's falling into the trough (after passage of initial wave) and being hit by the second wave crest.

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## III. Results of Test on Target.

- (a) Effect on propulsion and ship control.

The starboard shaft struts were broken, destroying propulsion power on two of four shafts. The rudder and its attachments were apparently in good shape. Other equipment vital to propulsion and ship control were unobserved after the test.

- (b) Effect on gunnery and fire control.

The fire control equipment was completely immobilized. The guns, left on the ship for test purposes, as viewed from air and by the divers were apparently in good shape. Gun galleries bordering the flight deck were not damaged. The MK 12-22 fire control antennae cannot be seen in photographs on pages 18 and 19.

- (c) Effect on watertight integrity and stability.

The explosion completely destroyed the watertight integrity of the ship. The ship remained upright throughout her sinking.

- (d) Effect on personnel and habitability.

Personnel in exposed areas would probably have been killed by the descending water column or washed overboard.

- (e) Total effect on fighting efficiency.

The ship sank as a result of test B.

## IV. General Summary of Observers' Impressions and Conclusions.

Photographs of the burst taken from towers and planes, after burst photographs taken of the array from PBM Charlie, the reports of the technical observer in PBM Charlie, the divers' reports, radar pictures, initial boarding team reports and the Bureau of Ships interim report for test B are the total available sources of material for this report.

The SARATOGA, after quickly disappearing in the descending water column, was not clearly seen until a little over 33 minutes had passed. Observations were continued from the air and at 1130 the Technical Observer, noticing that the SARATOGA was sinking, recommended that she be beached. Dangerous radiological

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conditions of both ship and water precluded this undertaking. The SARATOGA sank without any person getting aboard or even alongside.

The divers report finding the ship about 625 yards from the center of the array bearing 174 degrees true in about 180 feet of water. She was lying on her port bilge at about a 10 to 15 degree angle. Her bow tilted upward about five degrees. She was buried beyond the keel with the starboard bilge about seven to eight feet above the bottom.

Approximately fifty underwater pictures were taken. Only a few of these are included in the photographic section of this report because of their poor definition. See pages 30 through 41.

#### V. Preliminary Recommendations.

None.

#### VI. Pre-test Statistics.

(a) Instructions for loading the vessel specified the following:

ITEM	LOADING
Fuel oil	10%
Diesel oil	15 tons or less
Gasoline	None
Ammunition	66 2/3%
Potable and reserve feed water	95%
Salt water ballast	95%

Details of the actual quantities of the various items aboard are included in Report 7, Stability Inspection Report, submitted by the ships force in accordance with "Instructions to Target Vessels for Tests and Observations by Ship's Force" issued by the Director of Ships Material. This report is available for inspection in the Bureau of Ships Crossroads Files.

The SARATOGA at time of "B" burst floated at drafts of 27'8" forward and 31'6" aft. She had no list.

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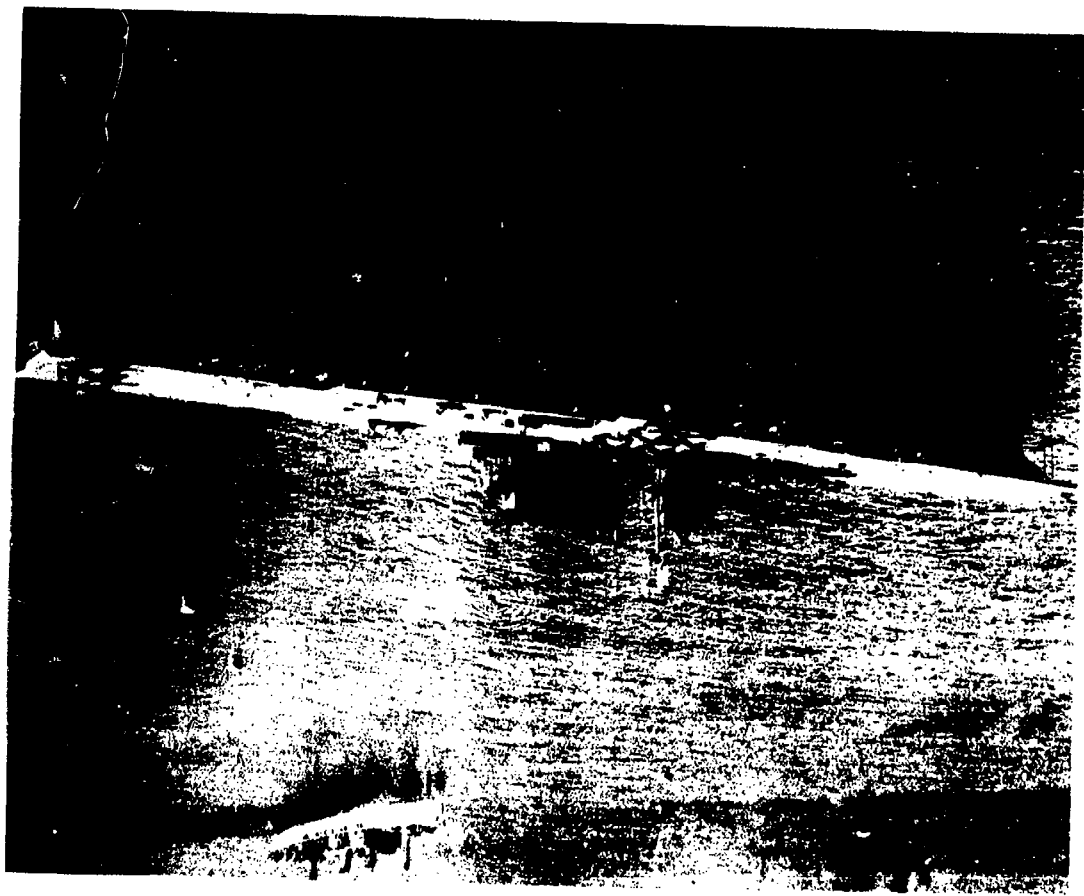
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PHOTOGRAPHS

TEST BAKER



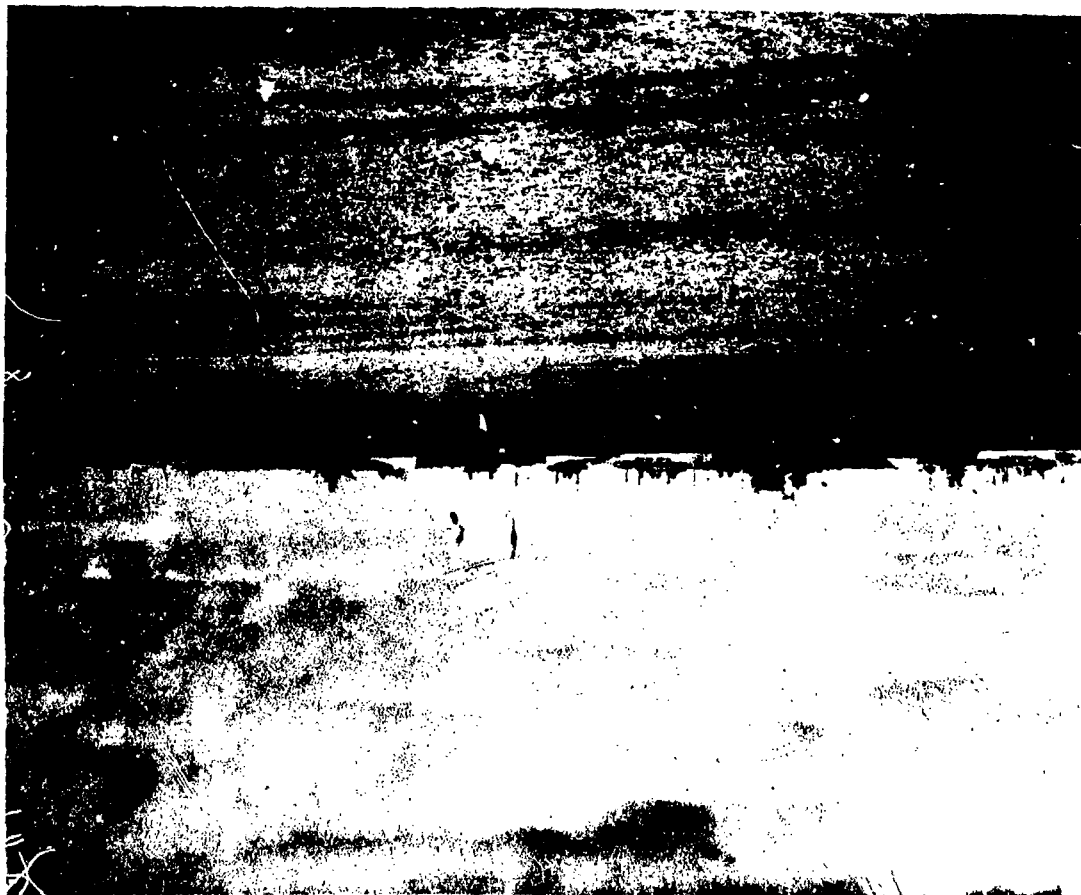
DB-CR-113-286. 0715 to 0850 (-11) 25 July 46/30"/obl/var. Eikini.  
Print #8. Pre-burst view of SARATOGA.

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USS SARATOGA (CVB-30)

6564



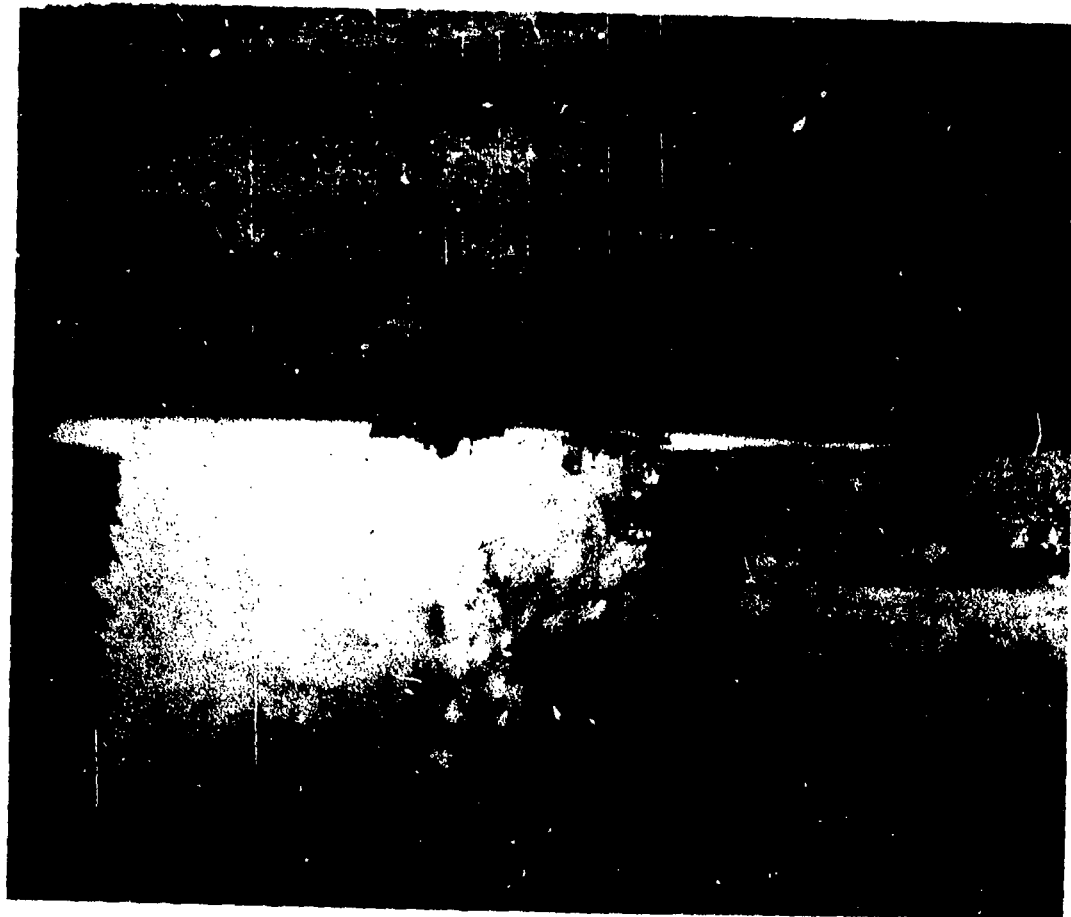
- DB-CR-T3A-31(R)-275. Print #1. Burst view of target array as seen from ENYU tower. Note relationship of SARATOGA's flight deck with APA on right and compare with picture on page 14.

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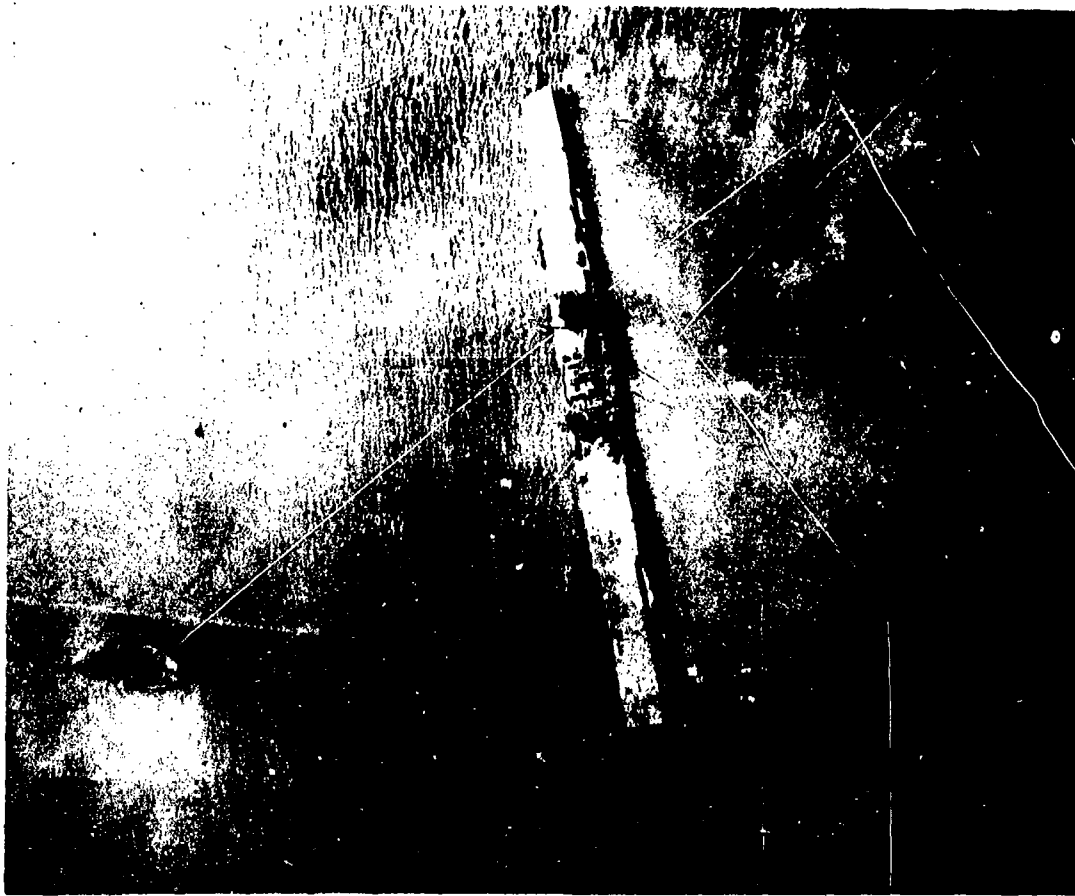
DB-CR-T3A-31(R)-275. Print #3. SARATOGA lifted into air. Bow has risen 29 feet. Stern has risen 43 feet.

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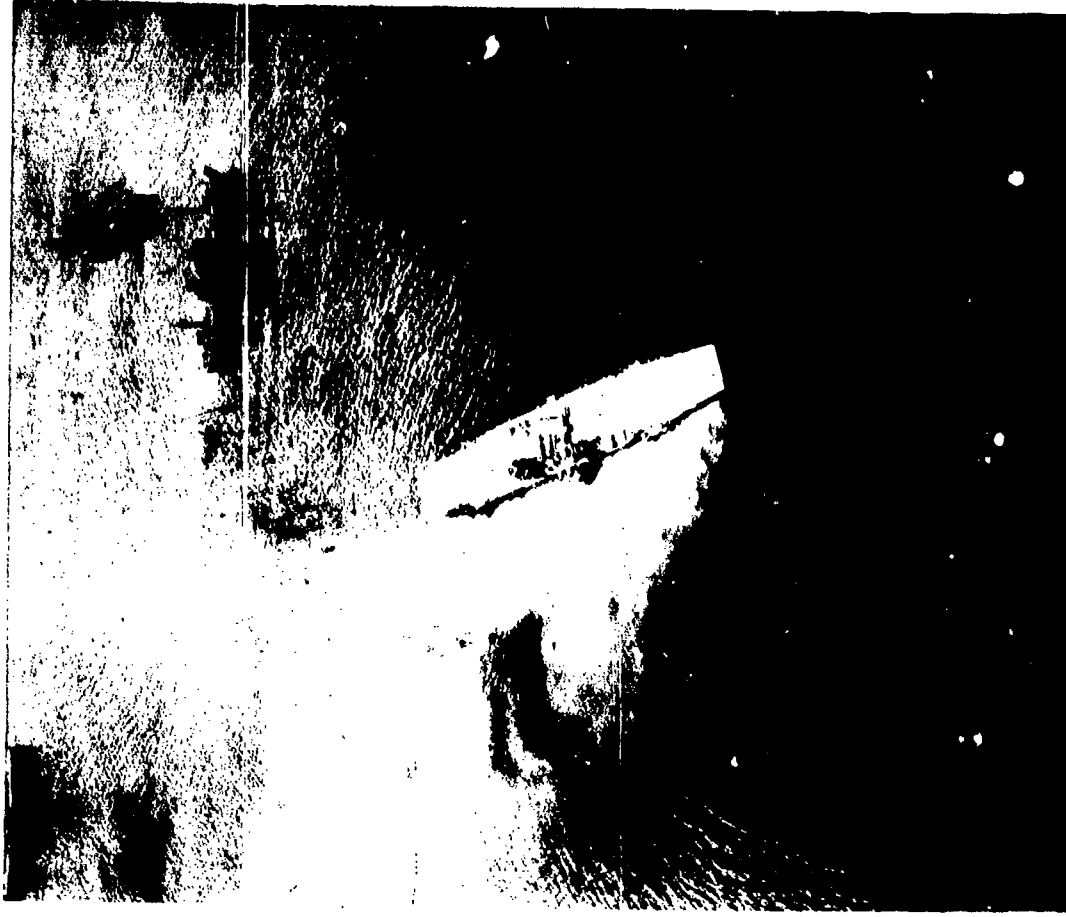
DB-CR-53. PBM "D" 4/25 July 46/8 1/4" obl 1700'. Print #87. Topped portion of SARATOGA's stack. Note second drip pan missing on after flight deck.

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DB-CR-53. PBM "D" 4/25 July 46/1 1/4" obl 1700'. Print #57. Starboard bow view of SARATOGA after Test B prior to actual submergence.

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DB-CR-53. PBM 'D' 4/25 July 46/8 1/4" obl 1700'. Print #58. Port bow view of SARATOGA.

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USS SARATOGA (CV3)

#568



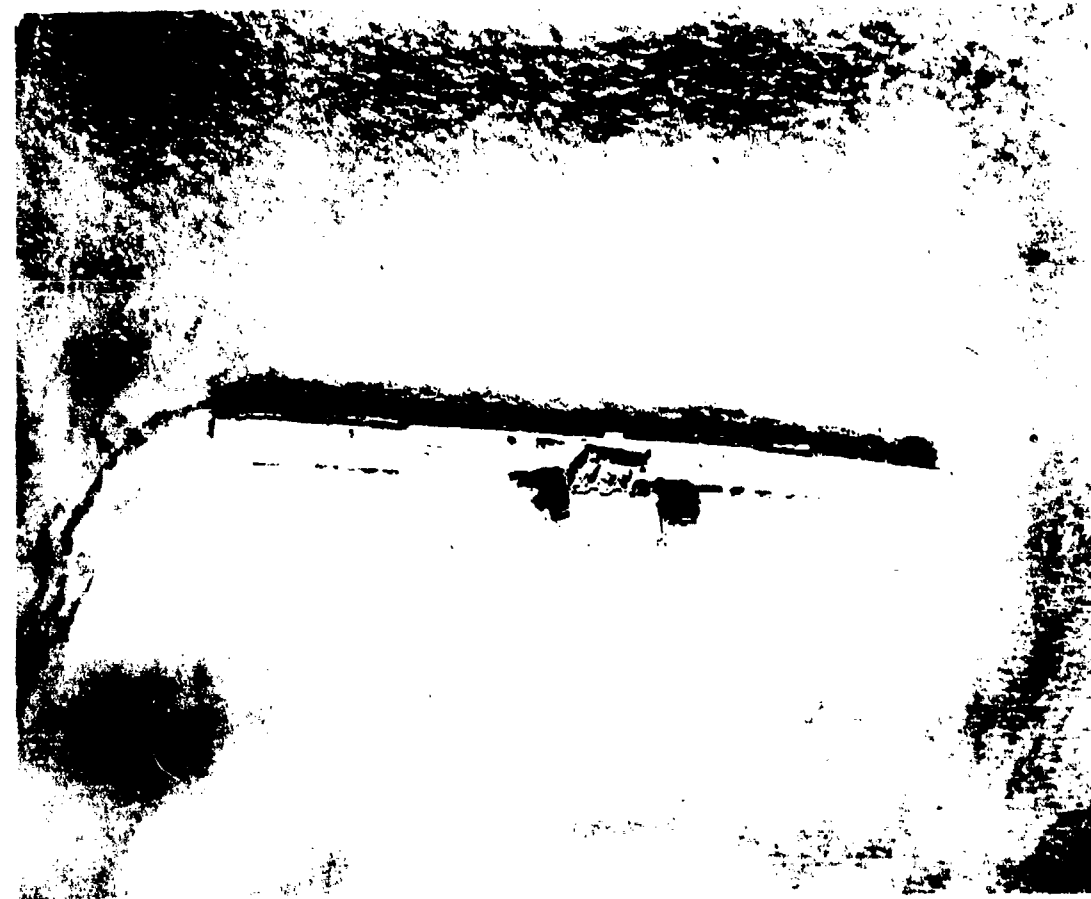
DB-CR-53. PBM 'D' 4/25 July 46/8 1/4" obl 1700'. Print #84. Cleared deck of SARATOGA. Compare with photo on page 13.

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USS SARATOGA (CV3)

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DB-CR-53. PBM 'D' 4/25 July 46/8 1/4" obl 1700'. Print #70. View of damaged forward elevator. White line on after flight deck marks outer starboard limit of deck depression.

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DB-CR-53. PBM 'D' 4/25 July 46/8 1/4" obl 1700'. Print #71. Stern view of SARATOGA.

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DB-CR-52. PBM C-2/5/25 July 46/8 1/4" obl 600'. Print #63. Start of photo sequence showing SARATOGA going down. Photo taken at 1555 on 25 July.

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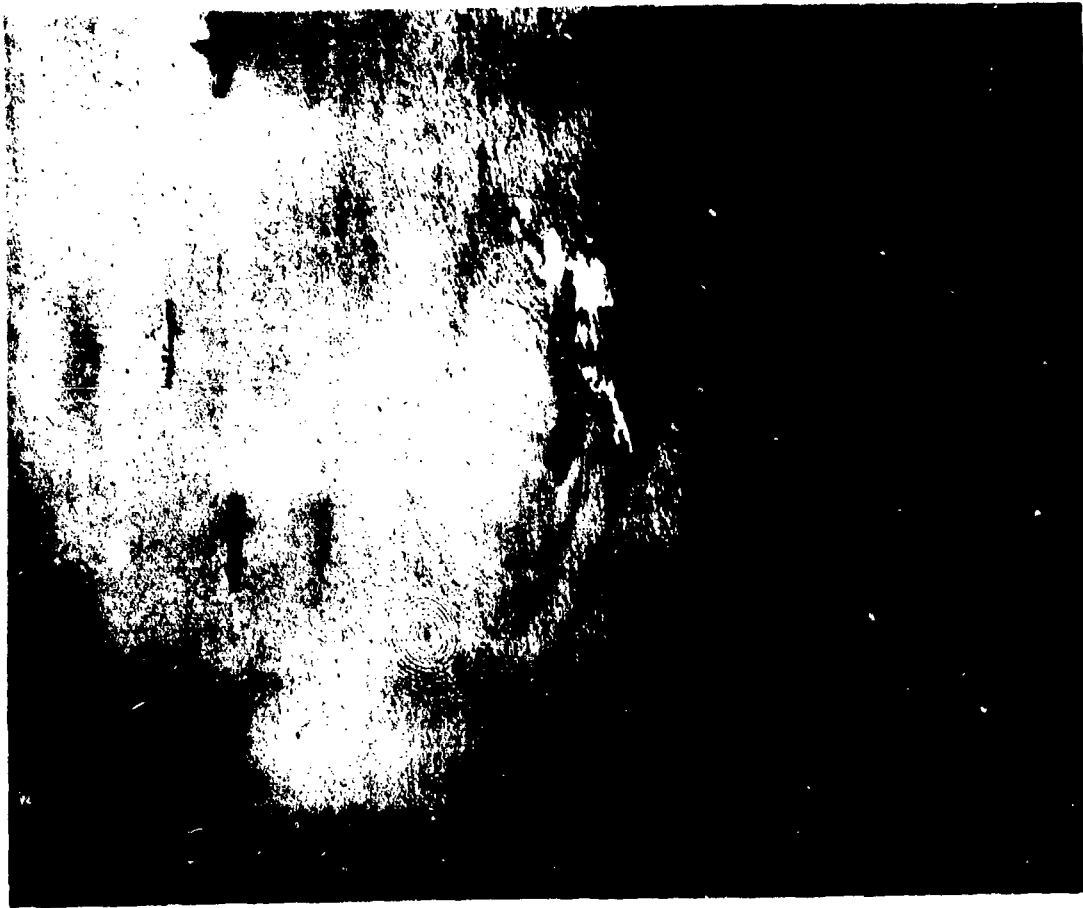
DB-CR-52. PBM C-2/5/25 July 46/8 1/4" obl 600'. Print #65. SARATOGA at 1556.

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DB-CR-52. PBM C-2/5/25 July 46/8 1/4" obl 600'. Print #72. SARA-  
TOGA sinking. Time of photo is 1557.

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DB-CR-52. PBM C-2/5/25 July 46/8 1/4" obl 600'. Print #75.  
SARATOGA at 1558. Note air bubbles surfacing.

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DB-CR-52. PBM C-2/5/25 July 46/8 1/4" obi 600'. Print #80. Only bow and mast now visible as SARATOGA submerges. Time is 1558.

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DB-CR-52. PBM C-2/5/25 July 46/8 1/4" obi 600'. Print #108. Last view of SARATOGA before going under at 1605.

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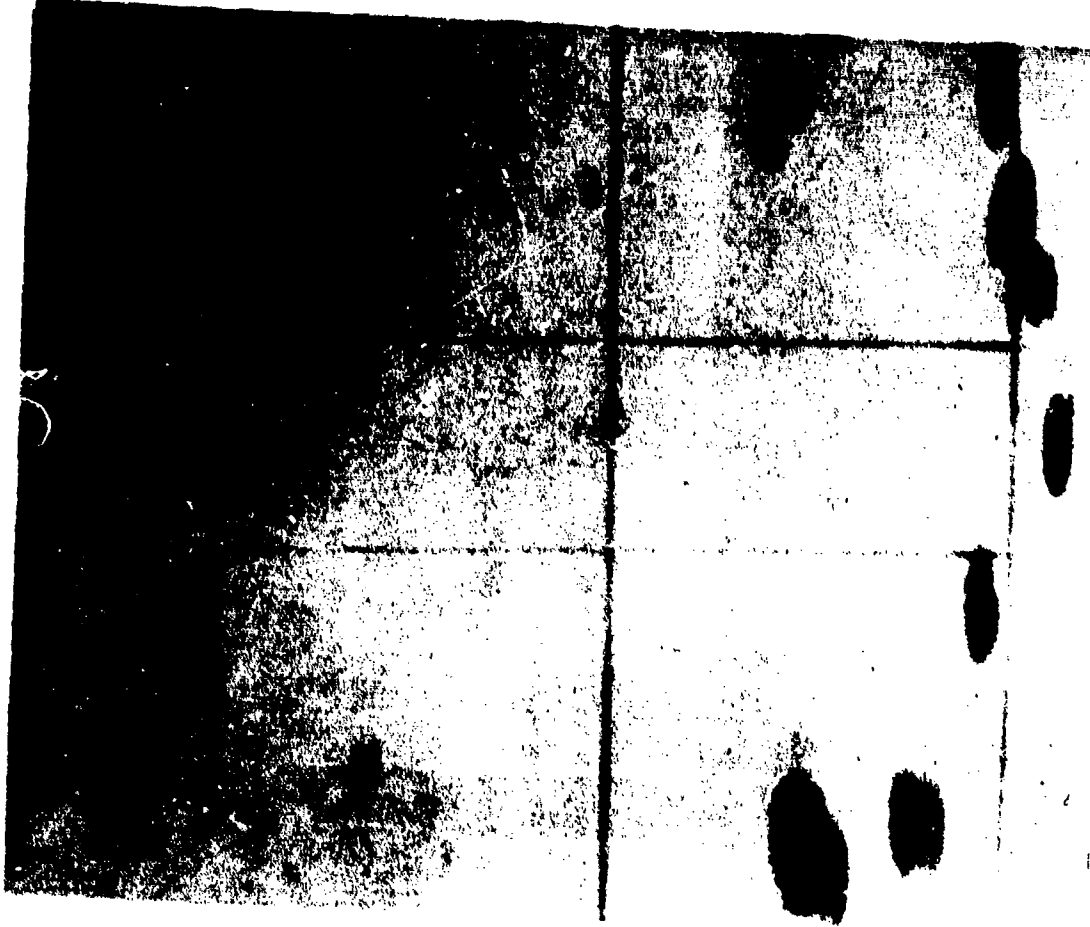


MPG-1. Radar Scope Picture. Print #8. Arrow points out pre-burst position of SARATOGA.

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MPG-1. Radar Scope Picture. Print #80. Arrow shows SARATOGA displaced radially outward a distance of 500 yards.

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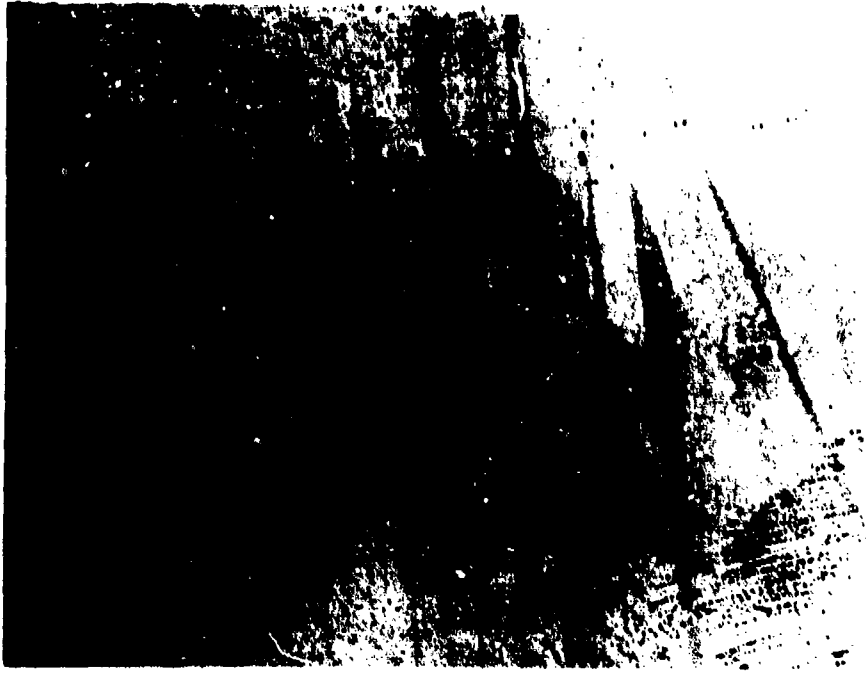
MPG-1. Radar Scope Picture. Print #861. Arrow shows SARATOGA returned to 500 yard radius. Displacement checks with position of SARATOGA as reported by the divers.

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UNDERWATER SARATOGA. Cr-5-S-49-12. Looking forward from SARATOGA's elevator shaft, showing displaced decking.

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UNDERWATER SARATOGA. CR-5-S-45-19. After end of SARATOGA flight deck.

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UNDERWATER SARATOGA. CR-5-S-45-18. After end of flight deck of SARATOGA compare with picture on page 31.

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UNDERWATER SARATOGA. CR-5-S-45-7. Airplane drip pan 20' from after end of SARATOGA's flight deck.

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CR-5-S-49-10. (UNDERWATER). Vicinity of forward elevator on SARATOGA.

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CR-5-S-49-7. (UNDERWATER). Vicinity of SARATOGA's forward elevator.

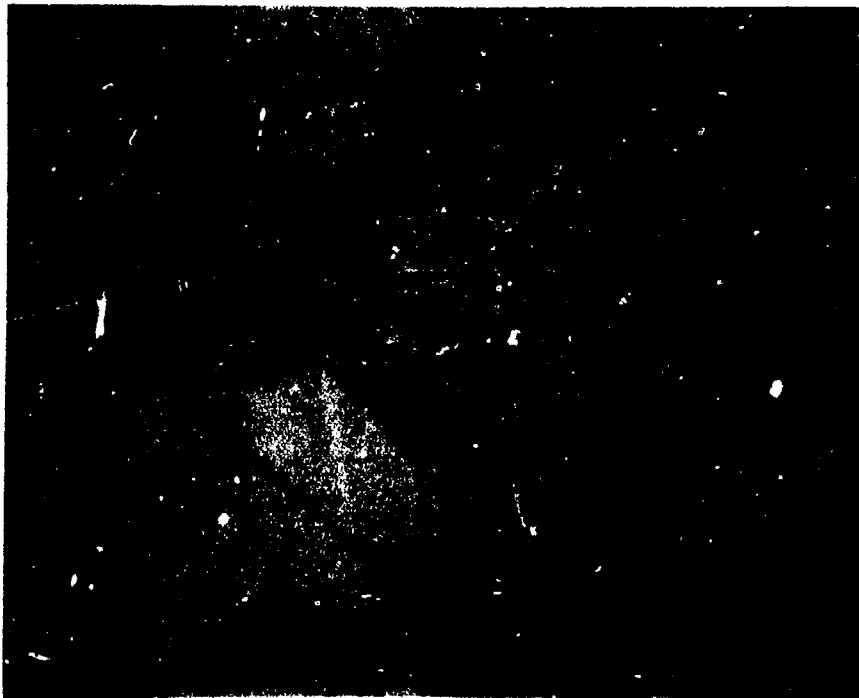
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CR-5-S-49-9. (UNDERWATER). Vicinity of SARATOGA's forward elevator.

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UNDERWATER SARATOGA. CR-5-S-49-16. Saratoga Aircraft crane in the vicinity of elevator shaft forward.

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UNDERWATER SARATOGA. CR-5-S-49-17. Another view of SARATOGA's aircraft crane in vicinity of elevator shaft forward.

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UNDERWATER SARATOGA. CR-5-S-49-15. SARATOGA aircraft crane.  
See pages 37 and 38.

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UNDERWATER SARATOGA. CR-5-S-49-20. High explosion drum  
in the vicinity of the forward elevator shaft of the SARATOGA.

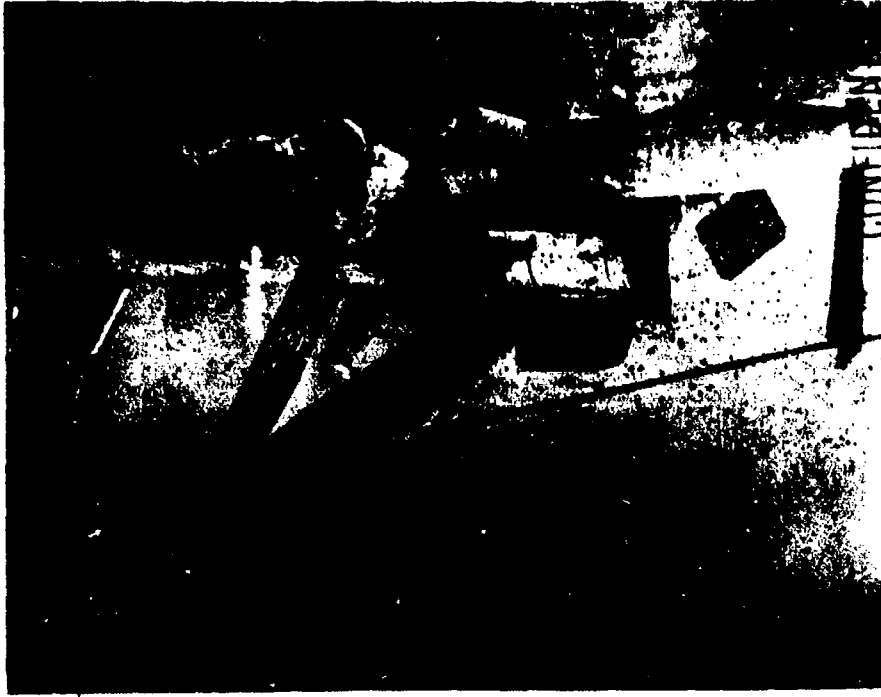
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37 Anthony X-62  
JULIA WATERS - CHAIRMAN  
~~MAY 18 1952~~  
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UNDERWATER SARATOGA. CR-5-S-49-19. SARATOGA flight deck in the vicinity of the elevator shaft forward showing rockets on the port side.

USS SARATOGA (CV3)

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ATOMIC ENERGY ACT 1946

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6801 Telegraph Road  
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TRC

18 April 1997

MEMORANDUM FOR DEFENSE TECHNICAL INFORMATION CENTER  
ATTENTION: OMI/Mr. William Bush (Security)

SUBJECT: Declassification of Reports

The Defense Special Weapons Agency has declassified the following reports:

/✓AD-366588 <del>4</del>	XRD-203-Section 12✓
AD-366589✓	XRD-200-Section 9
AD-366590✓	XRD-204-Section 13
AD-366591✓	XRD-183
/✓AD-366586 <del>x</del>	XRD-201-Section 10✓
/✓AD-367487 <del>4</del>	XRD-131-Volume 2✓
/✓AD-367516 <del>4</del>	XRD- <del>1</del> 143✓
/✓AD-367493 <del>4</del>	XRD-142✓
AD-801410L✓	XRD-138✓
AD-376831L✓	XRD-83✓
AD-366759✓	XRD-80
/✓AD-376830L <del>4</del>	XRD-79✓
/✓AD-376828L <del>4</del>	XRD-76✓
/✓AD-367464 <del>x</del>	XRD-106✓
AD-801404L✓	XRD-105-Volume 1✓
/✓AD-367459 <del>x</del>	XRD-100✓

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18 April 1997

Subject: Declassification of Report

AD-376836L ✓	XRD-98 ✓
AD-376835L ✓	XRD-97 ✓
AD-376834L ✓	XRD-96 ✓
AD-376833L ✓	XRD-95 ✓
<del>✓</del> AD-376832L ✓	XRD-94 <i>re-ingest</i>
✓✓ AD-367458 <del>x</del>	XRD-93 ✓
AD-367457 ✓	XRD-92-Volume 2
AD-367456 ✓	XRD-91-Volume 1
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AD-366763 ✓	XRD-85
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Chief, Technical Resource Center